GE
Consumer & Industrial

User manual

Digital Energy™ Uninterruptible Power Supply

On-line VH Series UPS
700 - 1000 - 1500 - 2000 - 3000 VA

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User manual

VH Series - Uninterruptible Power Supply
700 - 1000 - 1500 - 2000 - 3000 VA

Please read these instructions carefully before installation and start-up of the VH Series UPS. Keep this manual in a safe place for future reference.

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1 - Important safety instructions

1.1 Save these instructions

This manual contains important instructions that should be followed during installation and maintenance of the UPS. It also gives all necessary information about the correct use of the UPS. Before attempting to install and start up the UPS, carefully read this manual. Keep this manual next to the unit for future references.

Full understanding of and compliance with the safety instructions and warnings contained in this manual are the

ONLY CONDITIONS

to avoid any dangerous situation during installation, operation and maintenance work, and to preserve the maximum reliability of the UPS system.

GE refuses any responsibility in case of non-observance, unauthorized alterations or improper use of the delivered UPS.

The instructions in this manual are for UPS models VH Series 700, VH Series 1000, VH Series 1500, VH Series 2000 and VH Series 3000. Check your model number by looking at the rear panel of your UPS. Any difference in instructions is clearly indicated in the text, for instance '(VH Series 1000)'.

While every care has been taken to ensure the completeness and accuracy of this manual, GE accepts no responsibility or liability for any loss or damage resulting from the use of the information contained in this document.

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Due to technical improvements, some of the information contained in this manual may be changed without notice.

1.2 Safety rules

CAUTION! RISK OF ELECTRIC SHOCK.

The UPS contains batteries. The appliance outlets may be electrically live, even when the UPS is disconnected from the mains.

The UPS contains potentially hazardous voltages. Do not open the unit, there are no user serviceable parts inside.

All maintenance and service work, *except replacement of the batteries*, should be performed by qualified service personnel.

CAUTION

There may be damage to the equipment if procedures and practices are not strictly observed and followed.

NOTE

Do not attempt to service the UPS unless you have had proper training. Refer all maintenance and servicing to properly qualified, skilled and competent service personnel.

Qualified, skilled personnel are persons who (because of their training, experience, and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions) are authorised to be responsible for the safety of the equipment, at all times whilst carrying out their normal duties and are therefore aware of, and can report, possible hazards (observe IEC 364, DIN VDE 0105 and national wiring regulations and accident prevention rules).

2 - Introduction

2.1 Introduction

The **GE (General Electric) Digital Energy VH Series UPS**, a truly on-line uninterruptible power supply, protects your equipment from all forms of power interference, including complete power failures.

2.2 Intended use

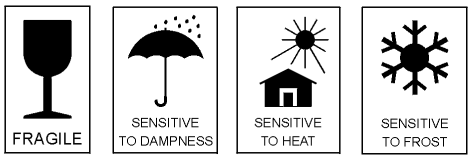
- Uninterruptible Power Supplies (UPS) are designed to protect sensitive electronic equipment such as computers and telecommunications equipment from all forms of power interference, including complete power failure.

	CAUTION! DO NOT plug household appliances such as electric heaters, toasters or vacuum cleaners into the UPS. The UPS output is intended to be used only for electronic loads such as computers and telecommunications equipment.

- The technical data as well as information concerning connecting requirements can be found on the rating label and in this document and shall be strictly observed.

2.3 Transport / storage

- No liability can be accepted for any transport damage when the equipment is shipped in non-original packaging.
- Store the UPS in a dry location with the batteries in a fully charged state. Storage temperature must be within -20 +45 °C. If the unit is stored for a period exceeding 3 months, optimal battery lifetime is obtained if the storage temperature does not exceed 25°C.
- If the unit is stored for an extended period of time, the batteries must be recharged periodically. Connect the unit to a wall outlet and recharge the batteries for 24 hours:
  - if the storage temperature is within -20 and +30°C: every 12 months,
  - if the storage temperature is within -20 and +45°C: every 3 months.

	CAUTION In case of storage, pay attention to:	

2.4 Warranty

GE Consumer & Industrial SA, operating through its authorized agents, warrants that the standard products will be free of defects in materials and workmanship for a period of 36 months after the date of invoice, or such other period as may be specified.

	NOTE This warranty does not cover failures of the product which result from incorrect installation, misuse, alterations by persons other than authorized agents, or abnormal operating conditions.

3 - Installation

3.1 Package contents

The shipping box contains a VH Series UPS, four plastic support parts + mounting set, plastic front panel, two plastic plugs, two mounting brackets and screws, a USB cable, two IEC male-female power cords, 1 mains power cord (VH Series 3000VA only), a CD ROM and this manual. Inspect the UPS for damage after unpacking. If any damage is present please immediately notify the carrier and place of purchase.

WARNING! In case of recognizable damage:

DO NOT connect any voltage to the unit
DO NOT put the unit into operation

IMPORTANT

Before making any connection and switching on the VH Series UPS, please check the following conditions:

- your mains supply is 220 - 240 Volts and 50 Hz (if the mains frequency is 60Hz, the output frequency of the UPS can be changed, see section 4.5), and
- the total power demand of the connected equipment does not exceed the rated output power of the VH Series UPS (the rear panel of the UPS shows the model, chapter 9 the ratings).

3.2 Installation rules

- The UPS is intended to be used in normal domestic and office situations.
- Protect the UPS, according to the wiring rules, with a 16A D-type fuse.
- The UPS must be powered from a single phase grounded wall outlet. Do not use extension cords.
- Avoid locations that are excessively humid, near water, near heat sources or in direct sunlight.
- The ambient temperature should not exceed 40°C. Optimal battery lifetime is obtained if the ambient temperature does not exceed 30°C.
- It is important that ventilation air can move freely around and through the unit. Do not block the air vents.
- Do not plug appliances such as electric heaters, toasters and vacuum cleaners into the UPS. The UPS output can be used only for electronic loads such as computers and telecommunications equipment.
- Be careful when connecting laser printers: be sure that the demanded power does not exceed the capacity of the UPS.
- The sum of the leakage currents of the UPS and the connected loads should not exceed 3.5mA.

3.3 Installation procedure

The UPS can be used in a stand alone tower format using the two supporting stands (section 3.3.1), or can be mounted in a 19 inch rack using the two mounting brackets (section 3.3.2). All required items are included in the delivery.

3.3.1 Vertical installation - preparations

1. If you want to install a battery pack as well, please read section 3.3.4 step 1-2 first, then proceed with step 2 below.
2. Place the UPS horizontally on a table or desk.
3. Assemble the four parts of the plastic supports (and metal rails in case of VH Series 2000 and 3000 VA) at the bottom-side of the UPS cabinet, using the 4 screws provided.
4. Connect the DC connector of the internal batteries.
5. Place the UPS upright, and insert the two black plastic plugs to cover the holes in the top panel of the UPS cabinet.
6. Assemble the front panel: insert the two metal clamps at the rear of the panel into the holes at the upper side of the UPS, then click the front panel into position.

The VH Series UPS is now ready for further connections: proceed with section 3.3.3.

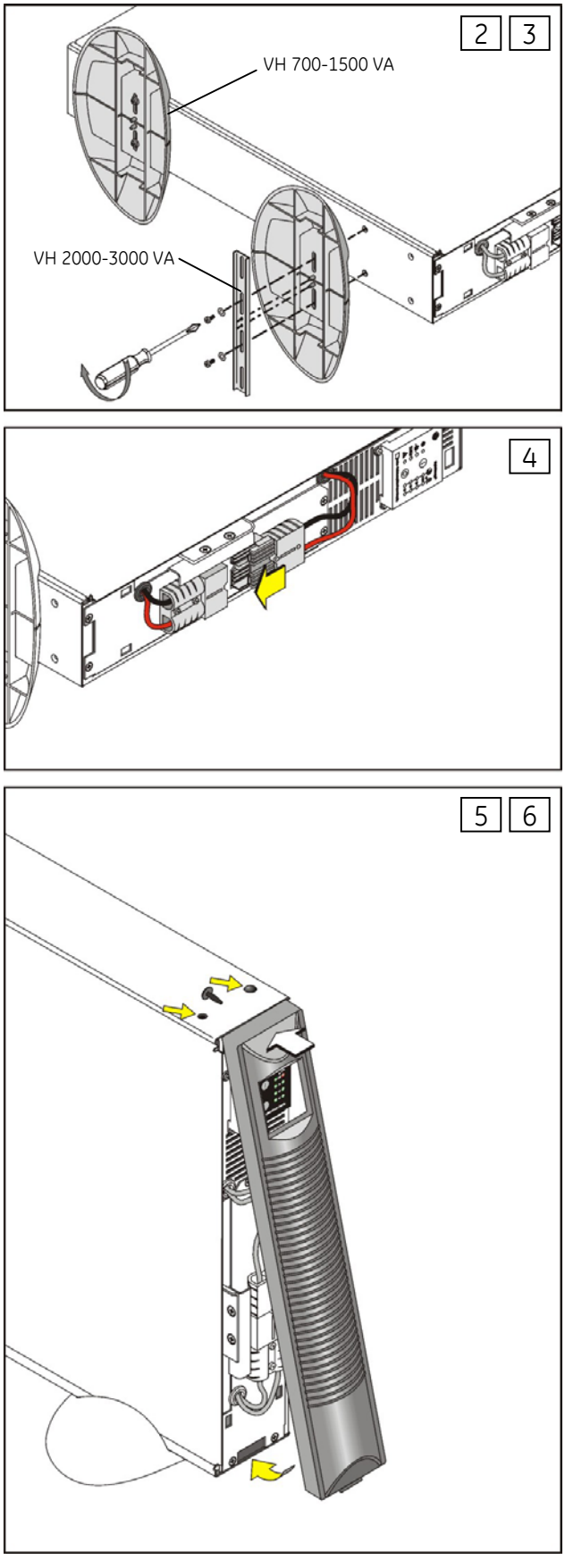


fig. 3.3.1: installation preparations - tower

3.3.2 Rackmount installation - preparations

1 Place the UPS horizontally on a table or desk.

2. Re-position the operating panel: remove the 2 screws that hold the panel and rotate the panel 90 degrees counterclockwise. Don't pull out the panel! Tighten the 2 screws again.

3. Install the two mounting brackets that came with the unit using the screws provided.

4. Connect the DC connector of the internal batteries.

5. Assemble the front panel: insert the two metal clamps at the rear of the panel into the holes at the right side of the UPS, then click the front panel into position.

6. Install the UPS into a 19' rack. The UPS cabinet must be supported by mounting rails, do not mount it by using the mounting brackets only. Fix the mounting brackets on the 19 inch enclosure with screws.

The VH Series UPS is now ready for further connections, please proceed with section 3.3.3.

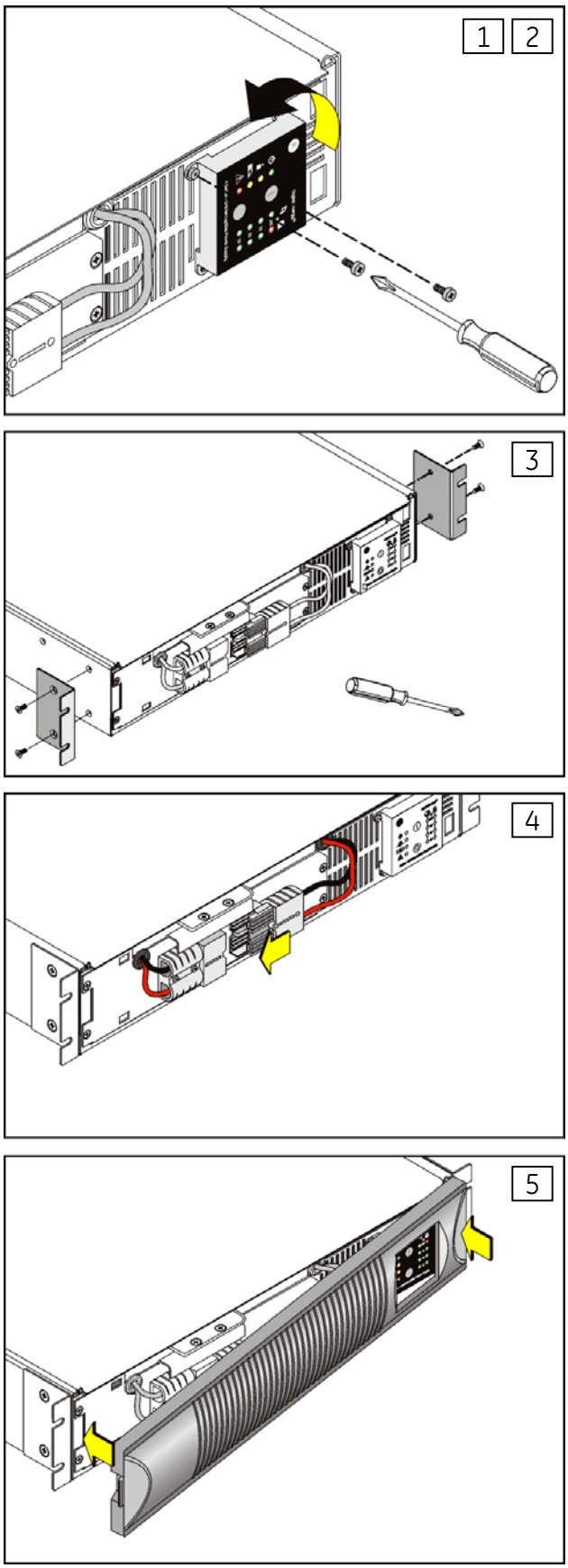


fig. 3.3.2: installation preparations - rackmount

3.3.3 Rear panel

The figures on this page show a VH Series 3000 VA. The differences with the rear panel - configuration of other models is ***clearly indicated*** in the text below.

1 Input socket
AC mains supply to the UPS
700-2000 VA: *smaller socket than shown here*

2 Input breaker
Protects the UPS from damage caused by high input currents
700-2000 VA: *breaker has lower rating than shown here*

3 Appliance outlets - max. rating 10A
To connect the loads to the UPS.
700 VA: 2 outlets
1000-1500 VA: 4 outlets
2000-3000 VA: 6 outlets

3a Appliance outlet - max. rating 16A
(VH Series 3000 VA only)
To connect a heavy load to the UPS. An output cord to connect a load to this outlet is not shipped with the unit.

4 DC connector ***(not on VH Series 700 VA)***
To connect a battery extension pack for extended battery runtime

5 Fan(s)
Electronically controlled cooling fan(s). Make sure ventilation air can move freely around and through the UPS.

6 USB port
See 5.1 for more information

7 RJ 11 port
See 5.2 for more information

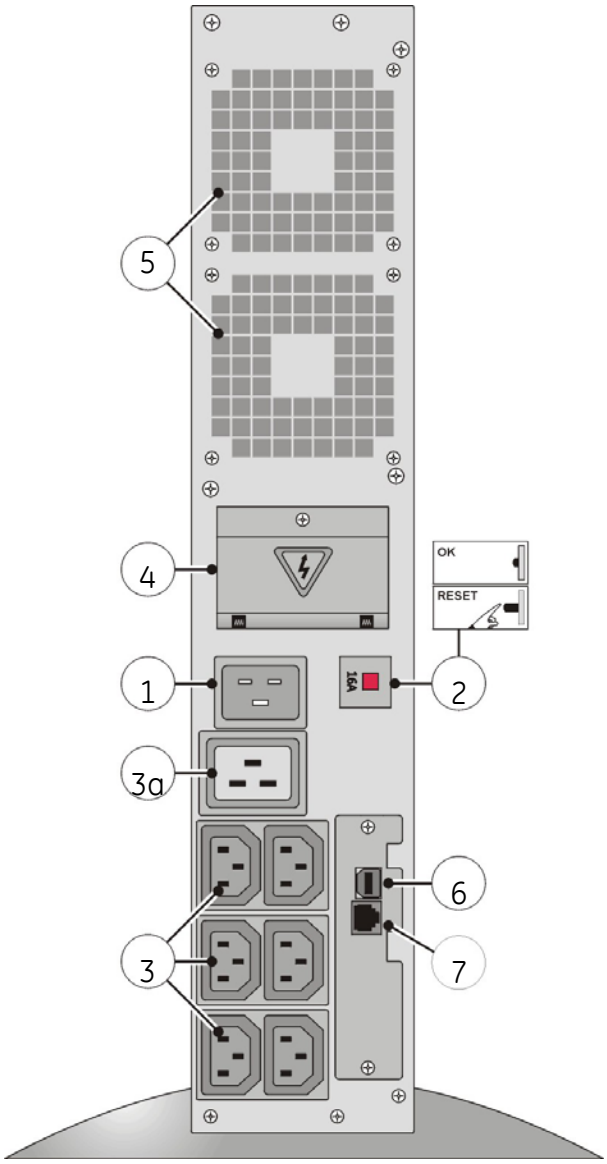


fig. 3.3.3.a: rear panel - tower (3000 VA model)

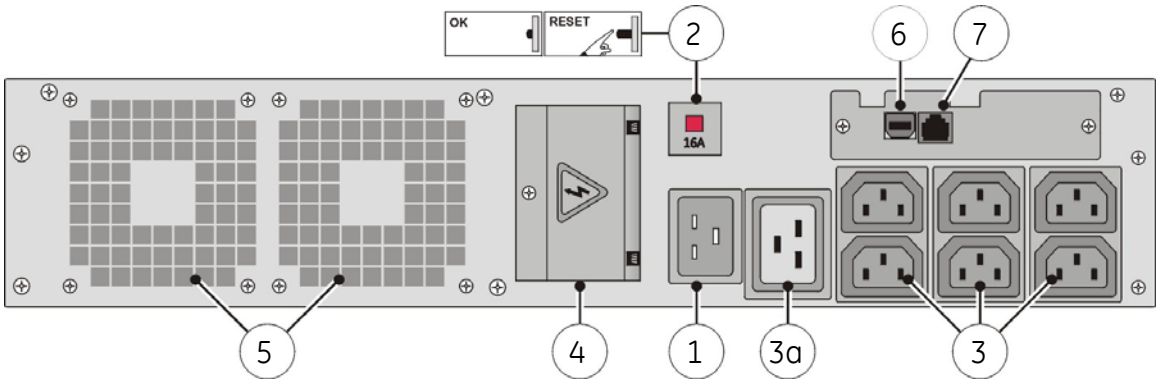


fig. 3.3.3.b: rear panel - rackmount (3000 VA model)

3.3.4 Installation of a battery extension pack

With a battery extension pack you can increase the battery runtime of the UPS. If you do not install a battery extension pack please skip this section and proceed with 3.3.5.

1 Before installation, check whether the nominal voltage of the battery pack is suitable for the UPS: the voltage mentioned on the label on the battery drawer of the UPS and the one on the rear panel of the battery extension pack (36 Vdc or 72 Vdc) should match.

2. UPS and battery pack can be mounted together in one set of mounting supports.

3. At the rear side the UPS and battery pack can be coupled using the coupling bracket that came with the battery pack.

4. Connect the DC connector of the battery pack to the DC socket of the UPS (4, fig. 3.3.3). You will hear a click when the cable is properly connected. Block the DC connector: install the small locking plate that came with the battery pack, and fasten it with the screw provided.

5. Connect the DC connectors at the front side of the battery pack (like in 3.3.1 step 4).

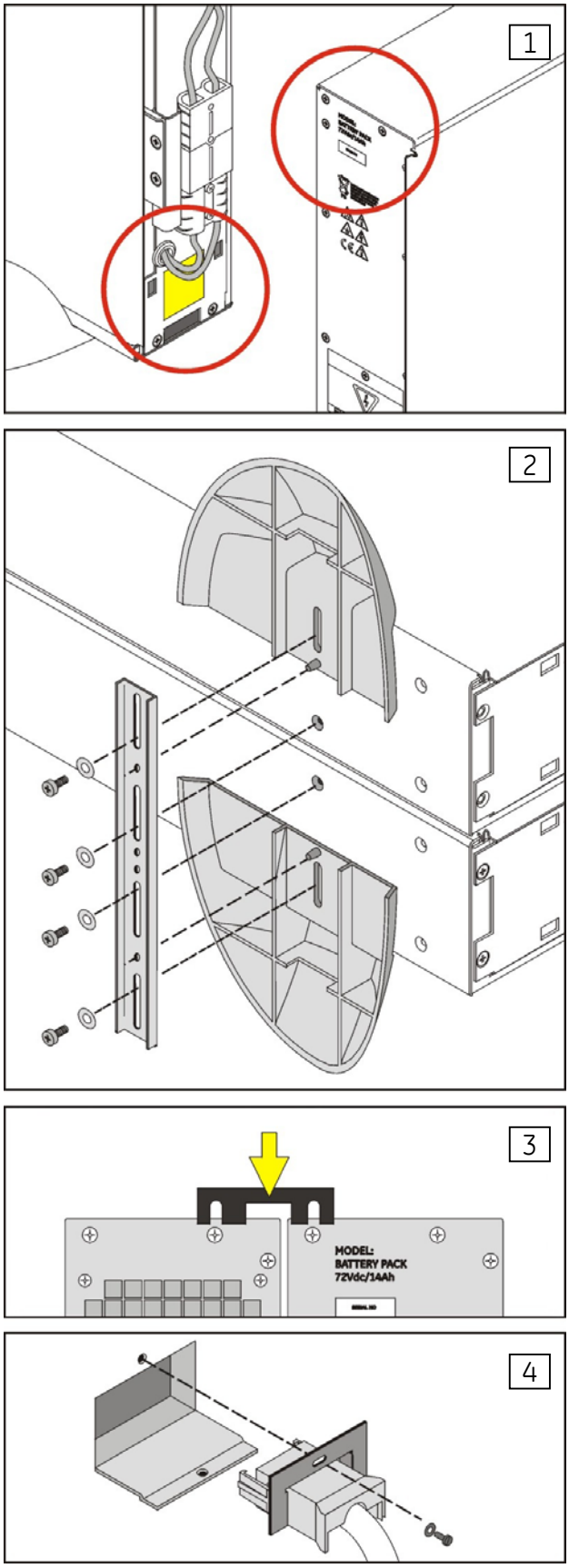


fig. 3.3.4.a: installing battery extension pack(s) to the UPS

6. Adjust the orientation of the 'operating panel' in case of rackmount use: loosen the 2 screws that hold the panel and reinstall it in reversed position.

7. Assemble the plastic front panel (like in 3.3.2 step 5).

8. Using the DC socket of the battery pack you can install a second, third, etc. pack. See chapter 6 for more information.

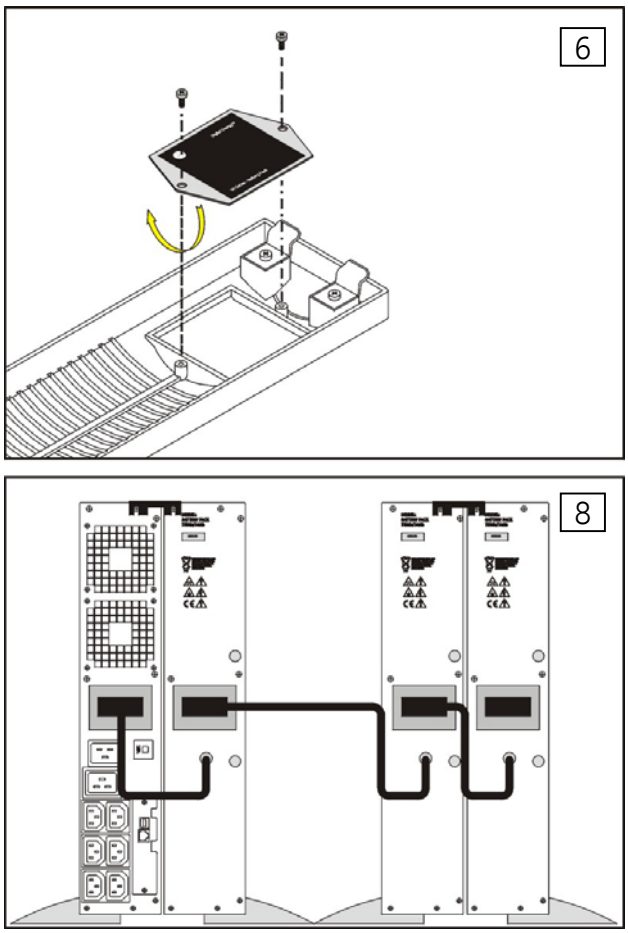


fig. 3.3.4.b: installing battery extension pack(s) to the UPS

3.3.5 Connecting interface devices

If you do not want to use the communication capabilities of the UPS, please skip this section and proceed with 3.3.6.
The UPS is equipped with two interface ports: a USB port and an RJ 11 port, allowing advanced communication between the UPS and a computer (network). Refer to chapter 5 for more detailed information.

3.3.6 Connecting power and load

1 Switch off your computer, and unplug it from the socket-outlet.

2 *VH Series 700-2000:*
Disconnect the power cord from the computer (rating 250Vac/10A) and connect this cord to the male input socket (1, fig. 3.3.3a/b) at the rear of the UPS.
VH Series 3000 only:
Connect the cord that came with the UPS to the male input socket.

3 Add up the power consumption (in VA) of the appliances that will be protected by the UPS ('the load') and make sure that the resulting value does not exceed the VA output rating of the UPS. This way you ensure that the UPS is able to supply the required output and prevent that an overload situation will happen.

4. Using the output cords provided, connect the load to the appliance outlets (3/3a, fig. 3.3.3a/b) of the unit. Spread the loads over the appliance outlets as equally as possible. If you use a distribution box to connect more than one appliance per outlet, please note that the maximum AC-current rating of each appliance outlet is 10A (outlet 3) or 16A (outlet 3a). See fig. 3.3.3a/b.

5 Connect the mains cord of the UPS to a working, grounded AC wall socket outlet. The green LED 'operation' will blink now: mains power is available and the batteries are charging. If the LED does not blink but illuminates continuously instead, press keypad '0' for one second.
If both LEDs 'operation' and 'alarm' blink and the beeper sounds 1/2secs, phase and neutral are reversed at the input of the UPS. Please read 4.4.12 and take appropriate measures.

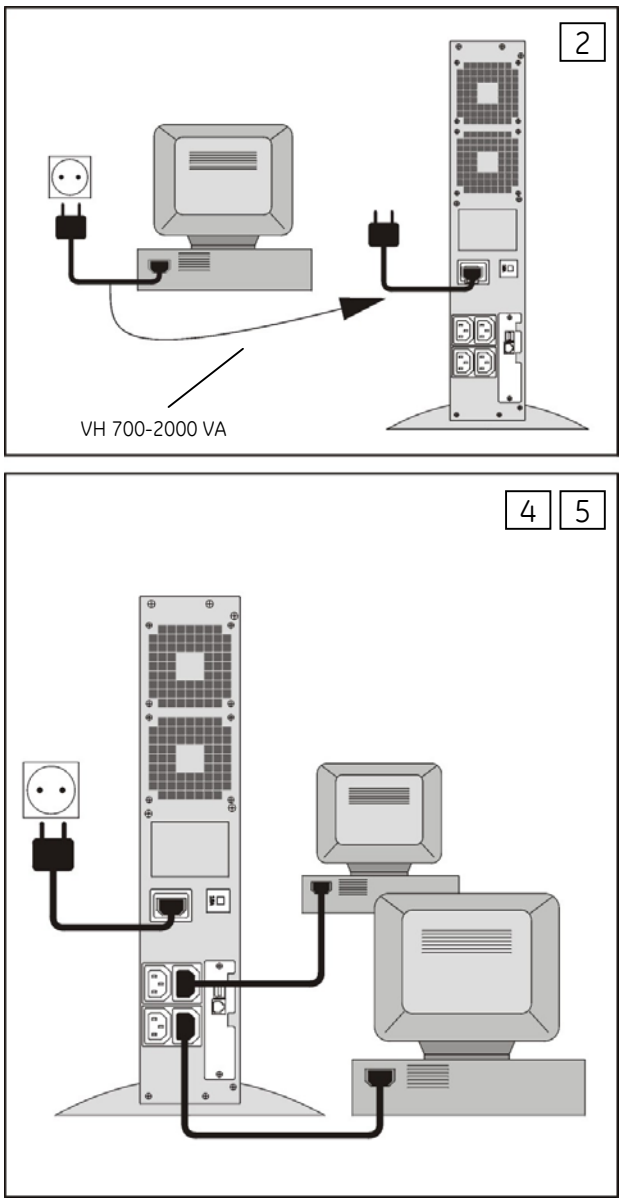


fig. 3.3.6: connecting power and load

6 For best results, allow the UPS to recharge the batteries during a period of approx. 2 hours. It is acceptable to use the UPS without first charging the battery, but the runtime may be reduced.

4 - Operation

4.1 Operating panel

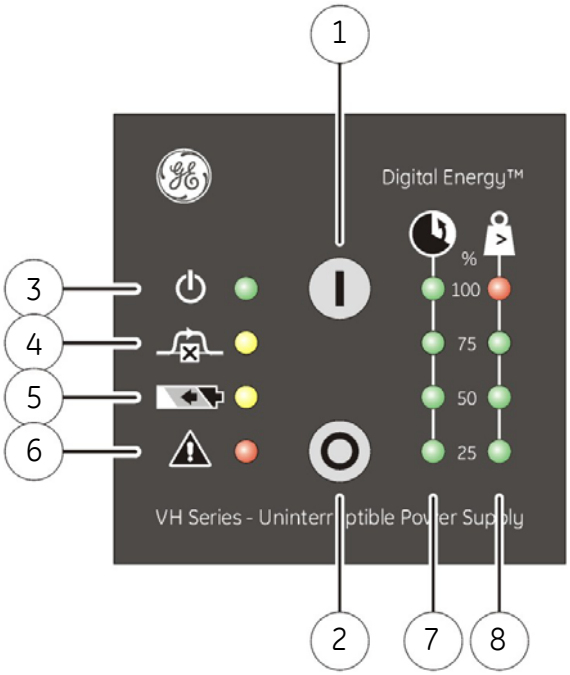


fig. 4.1: operating panel

switch / LED		main function
1 -	'on' switch	switches on the UPS, starts quick battery test (see 4.6)
2 -	'off' switch	switches off the UPS
3 -	LED 'operation'	on when the UPS is operating blinks if the UPS is in standby mode
4 -	LED 'on bypass'	on when the UPS operates in bypass mode: the incoming mains power is channeled directly to the load
5 -	LED 'on battery'	on in case of battery operation: the mains power fails, and the internal batteries supply the required power until either they are depleted or mains power returns.
6 -	LED 'alarm'	blinks in case of an alarm
7 -	LED bar 'runtime capacity'	the remaining available battery runtime for the actual load, in % of the maximum runtime with the actual load
8 -	LED bar 'load'	indicates to what extent the output capacity of the UPS is used by the actual load. If e.g. the 25% and 50% LED are on, the load exceeds 50% of the maximum load. If all 4 LEDs are on the unit operates in overload. As this is an abnormal situation the alarm LED will blink as well. More info in section 4.3.2.

4.2 Start-up

4.2.1 Start-up, mains available

1 *Via front panel:*
press keypad 'I' (1, fig. 4.1) briefly; LED 'operation' (already slowly blinking) will at first blink faster and after a few seconds it will illuminate continuously, indicating that the unit has started up.
Via UPS monitoring software:
startup after delay, see 4.4.11 for more information.
2 The equipment connected to the UPS can now be switched on.

4.2.2 Start-up, mains not available

If the mains input is absent (power cord not connected, or mains failure):
1 Press keypad 'I' until the buzzer sounds.
The LEDs 'operation' and 'on battery' will illuminate. The UPS operates on battery: it discharges the batteries. See 4.4.4 for further details about this operating mode.

4.3 Use: normal operation

4.3.1 Normal operation conditions:

- the mains supply is present,
- the UPS is on,
- the load does not exceed the capacity of the UPS and
- the operating temperature is below alarm level

4.3.2 No-load shutdown

If this function is activated, the UPS will switch off during a mains failure when the load is less than 5% of the maximum load. In this way unnecessary discharging of the batteries is avoided. The unit will automatically turn on again when mains power is restored. The default setting of the no-load shutdown function is: ***activated***.
The setting can be changed using the UPS monitoring software. For more information please refer to the manual that came with the software.
If the no-load shutdown function is activated and the load is smaller than the 5% threshold, the '25%' load LED will blink to warn you that the unit will switch off during a mains failure.

4.3.3 Switching off

During normal operation, via operating panel:
1 Press keypad '0' (2, fig. 4.1) for 1 second. If the UPS is switched off the output will always be absent for a few seconds to ensure that the connected equipment is able to reboot.
During normal operation, using UPS monitoring software:
1 Shutdown after delay, see 4.4.10.

During bypass operation: see section 4.4.3.
During battery operation: see section 4.4.4.

If electric isolation is required, unplug the power cord from the wall outlet.

4.4 Use: status and alarm indications

o status indications the operating mode

! low priority alarms abnormal operating situations

!! high priority alarms situations in which *the actual output voltage of the UPS is no longer guaranteed*; immediate action should be taken

	Situation	Indicators on front panel (fig. 4.1)						
o	**Standby** (4.4.1)	- - -						
o	**Startup pending** (4.4.11)	-----						
o	**Normal operation** (4.4.2)	———				**0 - 4** ———	**0 - 3** ———	
!!	**On bypass** (4.4.3)	———	———		-----	**0 - 4** ———	**0 - 4** ———	----- hi
o	**On battery** (4.4.4)	———		———		**0 - 4** ———	**0 - 4** ———	----- lo
!!	**Battery low** (4.4.5)	———		———	-----	**25%** -----	**0 - 4** ———	----- hi
!	**Bypass out of limits** (4.4.6)	———	-----		-----	**0 - 4** ———	**0 - 4** ———	----- lo
!!	**Overload** (4.4.7)	———			-----	**0 - 4** ———	**4** ———	----- hi
!	**Replace battery** (4.4.8)	———		-----	-----	**0 - 4** ———	**0 - 4** ———	----- lo
!/!!	**General alarm** (4.4.9)	———			-----	**0 - 4** ———	**0 - 4** ———	----- hi / lo
o	**Shutdown pending** (4.4.10)	-----				**0 - 4** ———	**0 - 4** ———	----- lo
o	**No-load shutdown activated, load < 5%** (4.3.2)	———					**25%** -----	
!!	**Input Phase-Neutral reversed** (4.4.12)	-----			-----			----- hi

Operating modes and corresponding indications, see 4.3.2 and 4.4.1 – 4.4.12.

- - - - = intermittent
——— = continuous
0 - 4 = number of LEDs that can be on, depending on runtime capacity / load
25% = LED 25% is blinking
hi = 1 / 2 secs
lo = 1 / 5 secs
mute buzzer: press push button 'I' briefly

4.4.1 Standby
The UPS output is off, but the batteries are charging, see 3.3.6 step 5

4.4.2 Normal operation
See 4.3.1.

4.4.3 On bypass
The UPS is equipped with an automatic bypass switch. This switch automatically transfers the load to the mains if the UPS is unable to deliver the demanded output power due to overload or overtemperature.
If all 4 load LEDs illuminate, bypass operation is caused by an overload. If only green load LEDs illuminate (the red load LED is off), bypass operation is caused by overtemperature. Take appropriate measures: reduce load and/or temperature.
The UPS will switch back to normal operation when the overload has been removed or the temperature has dropped below alarm level.
If a power failure occurs during bypass operation, the UPS will switch to battery operation and eventually, when the batteries are depleted, ***output power is lost***.
The bypass function can be disabled - see 4.4.6 and 4.5 for further details.

Fail safe bypass operation: if the UPS becomes defective, the load may be switched to bypass (provided that the bypass function was not disabled). As the status of the UPS is unknown in this situation the indications on the operating panel may differ.

4.4.4 On battery
The UPS uses the energy stored in the batteries: see chapter 9 'Batteries - runtime'.
The runtime capacity LED bar will show the remaining runtime. The UPS will shutdown:
- after the batteries have been discharged (automatic restart), or
- if keypad 'O' is pressed (restart via front panel required) or
- if a 'UPS shutdown' command is given by the computer. Restart depends on the setting of the 'auto restart' function:
  - if set 'on' the UPS will automatically restart when the mains returns
  - if set 'off' a manual restart is required, either as in 4.2.1 step 1 or via the UPS management software.

As default the 'auto restart' function is 'on'. The setting can be changed using the UPS monitoring software. For more information please refer to the manual that came with the software.

4.4.5 Battery low (end of runtime)
If during 'on battery' operation the 25% LED starts blinking, the batteries are nearly discharged: the remaining runtime is less than 2 minutes (default setting, adjustable via the UPS monitoring software). Controlled shutdown of any computer equipment is absolutely necessary at this point.
If the UPS operates at 100% load, the shutdown procedure should be completed within 2 minutes after the 'battery low' alarm started. If only part of the output capacity of the UPS is used this period can be longer, with aged batteries this period can be shorter.
When the batteries are fully discharged, the UPS is no longer able to power the connected equipment.

4.4.6 Bypass out of limits
The mains voltage or mains frequency are outside bypass input tolerance but inside UPS input tolerance (see chapter 9). Bypass operation is inhibited: if for whatever reason the UPS is not able to deliver the required output, output power is lost. If the input frequency is often out of tolerance – during which bypass operation is inhibited and an alarm is generated – it may be useful to disable the bypass function after which the unit operates as a UPS without automatic bypass switch. See 4.5.

4.4.7 Overload

The demanded power exceeds the normal capacity of the UPS. The alarm occurs when the load is > 100%. If the load exceeds 150% the UPS will immediately switch to bypass, assuming that the conditions for a transfer to bypass are fulfilled.
If an overload condition between 110-150% persists, the UPS will also switch to bypass operation.
During an overload the UPS may automatically switch off within a few minutes (load dependent) and output power is lost:

- if a transfer to bypass is inhibited (see 4.4.6), or
- if the bypass function has been disabled (see 4.5), or
- if the UPS operates on battery (see 4.4.4).

To avoid these problems, be absolutely certain that the power demands of the protected equipment are within the limits of the UPS.

4.4.8 Replace battery

Either the batteries are almost chemically worn out or the battery wiring, including the battery fuse, is faulty. If the batteries are aged, they must be replaced as soon as possible to ensure full protection for your equipment (see 7.4). Perhaps the 'replace battery' alarm occurs after a test which you started immediately after installation or after a power failure. In this case the alarm may be incorrect as the batteries have been (partly) discharged during transport or storage or during the power failure. Allow the UPS to recharge the batteries. See also 4.6.

4.4.9 General alarm

'General alarm' comprises a group of alarms; the buzzer behaviour indicates which alarm is active:

1 / 2 secs:	General fault Overload (see 4.4.7) Overtemperature Output out of tolerance
1 / 5 secs:	Charger failure Bypass out of limits (see 4.4.6) Replace battery (see 4.4.8)

4.4.10 Shutdown pending

The UPS monitoring software allows you to switch the UPS into standby mode after a programmable delay time. During countdown the 'operation' LED will blink 2x per second and the buzzer will beep every 5 seconds.

4.4.11 Startup pending

The UPS monitoring software allows you to start up UPS after a programmable delay time. During this delay time the 'operation' LED will blink 2x per second.

4.4.12 P-N (Phase-Neutral) reversal indication

If the P-N reversal indication is enabled, the UPS will indicate whether the voltage between Neutral and Earth (Ground) at the UPS input exceeds a certain voltage (i.e. Phase and Neutral at the UPS input are reversed in an earthed/grounded Neutral system). In this potentially unsafe situation both LEDs 'operation' and 'alarm' will blink fast and the buzzer will sound. Reversing the mains plug will prevent this unsafe situation and will cancel the alarm. In case of non-earthed/grounded Neutral system this indication should be disabled.
The default setting of the P-N reversal indication is: ***enabled***. Changing of the setting is described in section 4.5.

4.5 Use: setup mode

In the setup-mode the following parameters can be changed:

- output voltage: 220 / 230 / 240 Vac
- bypass: enable / disable (see 4.4.6)
- P (Phase) - N (Neutral) reversal indication: enable / disable (see 4.4.12)
- output frequency: 50 / 60 Hz

The setup mode can only be entered if the UPS is in 'standby' -mode: connected to a live wall outlet and switched off (LED 'operation' blinks).

1 Press keypad 'O' and keep it pressed while pressing 'I' simultaneously. Release both buttons. The setup sequence starts with the setup of the output voltage, indicated by a blinking LED 'operation'.
2 Scroll through the four functions with keypad 'I', one of the LEDs 'operation', 'on bypass', 'on battery' or 'alarm' will blink, indicating which function has been selected (see fig 4.5).
3 Toggle the setting of the selected function by pressing switch 'O'. The LEDs on the LEDbar 'runtime capacity' shows the setting.
4 Store the new settings and leave the setup mode: press keypad '1' and keep it pressed while pressing '0' simultaneously. Release both buttons.

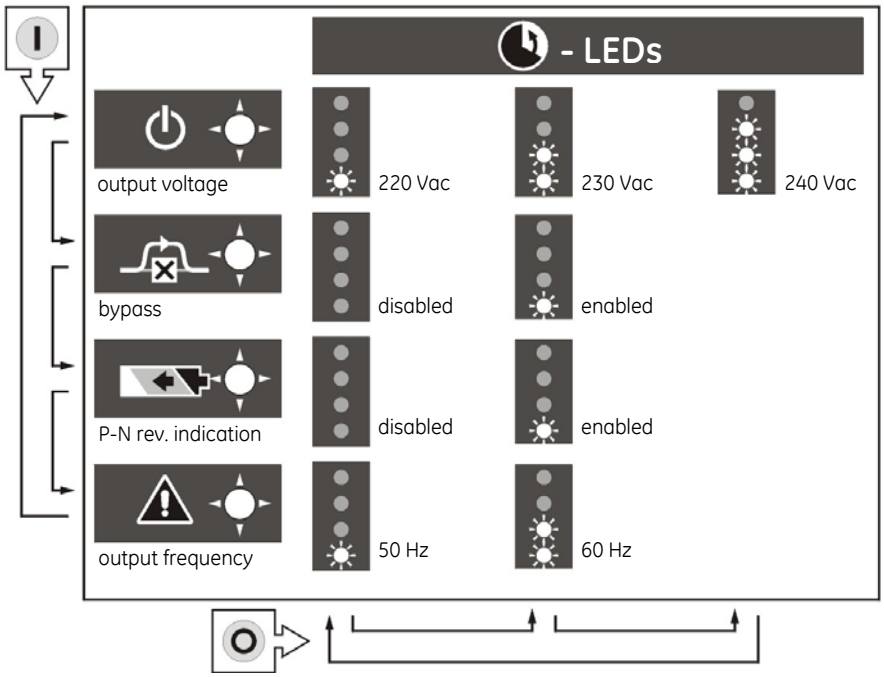


fig. 4.5: setup menu

	NOTE The unit can be used as a frequency converter: the input frequency range is 45-66Hz, the output frequency is selectable 50/60Hz. If the unit is used as a frequency converter, the bypass function is no longer available. As a result an audible alarm will be generated continuously (see 4.4.6). To avoid this, we advise to disable the bypass.

	WARNING Changing of the output frequency can cause severe damage of equipment connected to the appliance outputs of the UPS: Be sure that the new frequency is suitable for the connected equipment!

4.6 Battery management

Maximum battery life and reliability are obtained by the following features:

- **Quick battery test**

The quick battery test checks whether the batteries and their wiring are healthy. If a quick battery test shows that the batteries are close to being worn out, a 'replace battery' alarm will be generated (see 4.4.8). The batteries must be replaced as soon as possible (see 7.4).

Automatic battery test

The VH Series UPS conducts periodic automatic battery tests:

- 5 hours after manual switch-on
- 5 hours after return of mains following any power failure, and
- 30 days from the last battery test

Manual battery test

A quick battery test can be initiated manually

- either via the front panel, by pressing pushbutton 'I' for 5 seconds during normal operation,
- or via UPS monitoring software. For details please refer to the manual of your software.

NOTE

If the test is started manually immediately after installation or after a power failure, the UPS may generate a false 'replace battery' alarm as the batteries have been (partly) discharged during transport/storage or during the power failure.

- **Deep battery test**

A deep battery test, to be initiated through the UPS software via the USB communication port, checks the actual battery capacity in order to ensure accurate runtime prediction. During a deep battery test the batteries will be discharged until 'battery low' alarm level. Please note that immediately after a deep battery test the expected runtime is very short: allow the UPS to recharge its batteries. For details please refer to the manual of your UPS software.

- **Temperature compensated battery charging**

This feature adjusts the battery charge voltage according to the ambient temperature. As a result poor charging of the batteries under low temperature conditions and overcharging of the batteries under high temperature conditions are avoided.

- **Load dependent battery-end-voltage**

The allowable final battery voltage depends on the discharge current: the higher the current, the lower the 'end-of-discharge' battery voltage. In this way maximum battery capacity is obtained without over-discharging. Over-discharging would result in shortened service life and failure to recover normal capacity.

- **Automatic boost charge**

This feature reduces the battery recharge time considerably: totally depleted batteries will be recharged to 90% in approx. 1.5 hours, provided that discharging took place at 100% load.

5 - Communication

5.1 USB port

The USB port is a plug-in interface port which enables advanced communication between the UPS and the computer (UPS software required). The interface port is operative as soon as the mains power cord is plugged into a live wall outlet, even if the UPS is switched off.
For more information please refer to the user manual that comes with the interface software. We strongly recommend to use only original GE Digital Energy software products in combination with the interface port.

5.2 RJ 11 port

The RJ 11 port is a plug-in contact interface port.

Pin #	Function
1	Mains failure
2	General alarm [1)]
3	Battery low
4	On bypass
5	Remote UPS shutdown / RxD
6	GND

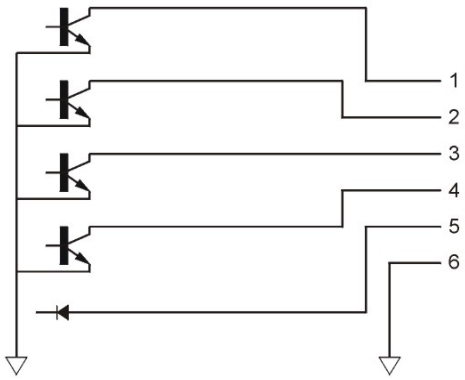


fig. 5.2

1)
Active if the output voltage of the UPS is no longer guaranteed due to other circumstances than already indicated by pin 1-3-4. The alarms are listed in section 4.4.9.

5.3 USB / RS232 / Relay interface card (option)

The card is equipped with
- USB port as described in 5.1
- RS232 port
- potential free change-over relay contacts for the following alarms:
  - mains failure
  - general alarm
  - battery low
  - bypass active

For more information please refer to the user manual that comes with the interface card.

5.4 SNMP / Web interface card (option)

The SNMP card makes the UPS 'SNMP manageable': it allows the data interface to be connected directly to an Ethernet network. For more information please refer to the user manual that comes with the interface card.

6 - Option: extended runtime (VH Series 1000-3000)

Extended runtime can be obtained by connecting a separate battery extension pack to the UPS. In this case the UPS must be informed about the new total battery capacity to allow a reliable recalculation of the available runtime (please contact your dealer). Dependent of the charge condition of the new batteries the new runtime calculations may temporarily be unreliable.
The additional batteries increase the recharging time for the unit, all other operational information is the same as for standard models. It is not allowed to connect an external charger to the UPS!

7 - Maintenance

7.1 Safety

	DANGER When the UPS operates, all parts of the electronics are directly connected to the utility and high voltages are present on all internal parts, including the battery. Even after disconnection from the utility, all parts inside the UPS, including the battery, conduct dangerous voltages (except the RJ11 and USB output). For your safety, only authorized service personnel may remove the cabinet cover. Refer to section 1.2 for further details.

7.2 General

The GE Digital Energy VH Series UPS is virtually maintenance free: take care of proper environmental conditions and keep air inlets/outlets free of dust. Please read 3.2.

	NOTE Apart from battery replacement refer maintenance and service work to qualified and skilled personnel only. Refer to section 1.2 for further details.

7.3 Recycling the UPS at the end of service life

	NOTE This product has been designed to respect the environment, using materials and components respecting eco-design rules. It does not contain CFCs (Carbon Fluorine Chloride) of HCFCs (Halogen Carbon Fluorine Chloride).

	The batteries contain lead, which is a harmful substance for the environment. Proper disposal or recycling of the batteries is required. Refer to your local codes for disposal requirements.

	GE Consumer & Industrial, in compliance with environment protection recommends that the UPS equipment, at the end of its service life, must be recycled conforming to the local applicable regulations.

7.4 Batteries

7.4.1 General

The service life of the battery is from 3 to 6 years, depending on the operating temperature and on the number of discharge cycles.

As a healthy battery is critical to the performance of the UPS, an automatic quick battery test is performed regularly to ensure failsafe operation (see section 4.6). When the condition of the battery is critical, a 'replace battery' alarm will be activated (see 4.4.8). Replace the batteries as soon as possible, proceed with section 7.4.2.

	NOTE under certain circumstances a manual battery test can result in a false alarm: please see 4.6 'quick battery test'

7.4.2 Battery replacement

Please refer to figure 7.4.2. It shows a VH Series 3000VA model. The battery (tray) configuration of other models may differ, but the basic principle is the same for all VH Series models.

	NOTE During battery replacement the UPS will not be able to support the load if a mains failure occurs! It is recommended to switch off the load before disconnecting the DC connector as in step 2.

1. Remove the plastic front from the UPS cabinet (and/or battery cabinet)
2. Disconnect the DC connector
3. Loosen the 4 screws that hold the battery tray
4. Slide out the battery tray. Be careful: it can be heavy!
5. Insert the new battery tray into the UPS, fix it with the 4 screws.
6. Connect the DC connector.
7. Install the plastic front panel.

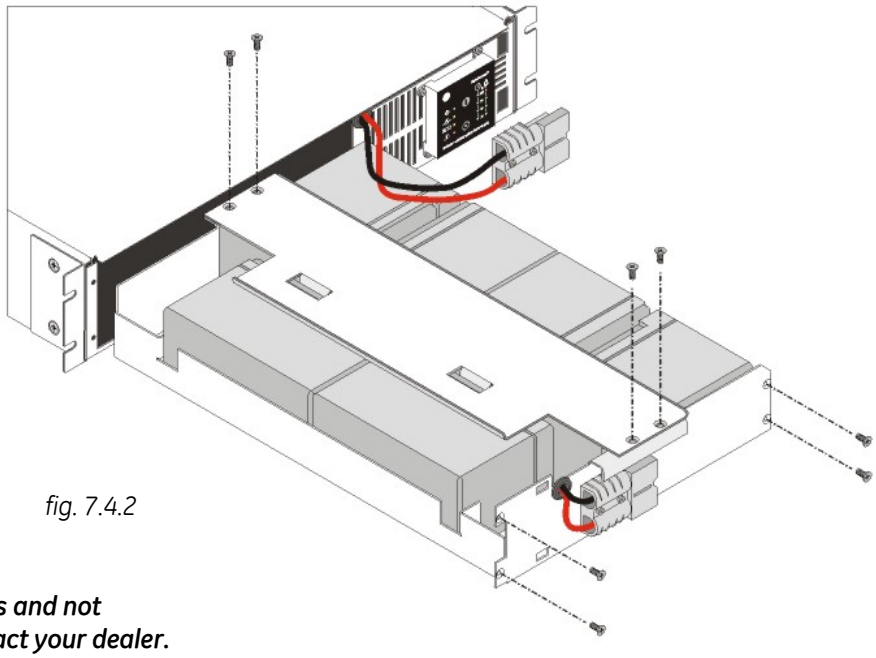


fig. 7.4.2

If you want to change only the batteries and not the full tray with batteries, please contact your dealer.

General guidelines:

- When replacing the batteries, use only the same type and size battery.
- Never short the battery terminals. Shorting may cause the battery to burn. When working with batteries remove watches, rings or other metal objects and only use insulated tools.
- Avoid charging in a sealed container.
- Proper disposal of batteries is required: refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire: they may explode.
- Never disassemble or reassemble batteries; their contents (electrolyte) may be extremely toxic. If exposed to electrolyte, wash immediately with plenty of water, if eye contact occurs flush with water and contact a physician.

Don't throw batteries away, treat them as harmful waste

8 - Troubleshooting

Whenever a malfunction occurs, first check external factors (e.g. connections, temperature, humidity or load) to determine whether the problem is caused by the unit itself or by its environment. Subsequently check the thermal circuit breaker: it may be tripped. If so: reset it (see fig. 3.3.3 a/b) and be sure that the UPS is not overloaded.
The following chart is a simple troubleshooting checklist only. If the suggested solution does not succeed, or if the information is insufficient to solve the problem, please contact your dealer or consult www.gedigitalenergy.com.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Thermal Circuit Breaker (TCB) tripped	UPS overload	Reduce load, reset TCB (2, fig. 3.3.3 a/b)
	System failure	Contact your dealer or consult www.gedigitalenergy.com
UPS will not switch on (without using 'battery start') and the output has been off for a few secs. (see also 4.3.3)	Line cord not connected	Read 3.3.6 Connect line cord
	Dead wall socket outlet, or mains voltage out of limits	Contact qualified electrician
	Tripped Thermal Circuit Breaker	See above
UPS switched off automatically	UPS overtemperature	Allow UPS to cool down
	Mains failure, battery discharged	Wait until mains returns
	Programmed shutdown in progress	See 4.4.10
	The load is < 5% of the max. load and no mains power is present. (No-load shutdown function is active, see 4.3.2)	Wait until mains returns
LEDs 'operation' and 'alarm' blink, buzzer sounds 1/2 secs. UPS does not start.	P (phase) and N (neutral) are reversed at the UPS input in a system with grounded Neutral.	In a system with grounded Neutral: reverse the mains plug. In other systems: disable the indication. See 4.4.12 and 4.5. *In case of doubt contact a qualified electrician.*
LEDs 'alarm' and 'on battery' blink, buzzer sounds 1/5 secs	Battery test just after installation or mains failure	Allow the UPS to recharge the batteries
	Battery test shows weak battery	Read 7.4, have the batteries replaced

9 - Specifications

VH Series	**700**	**1000**	**1500**	**2000**	**3000**
Ratings					
Voltage Amperes (VA) with computer type load	700	1000	1500	2000	3000
Watts (W) with resistive load	490	700	1050	1400	2100
Input thermal circuit breaker (A)	7	7	8	10	16
Internal input fuse 250V, slow (A)	8	8	10	16	20
Input converter					
AC input voltage	220 - 240 V				
AC input voltage range	100% load: 160 - 280 V 70% load: 130 - 280 V input >280 Vac: UPS switches to battery operation				
Minimum start-up AC voltage	170 V (at any load)				
Input current waveform	sinusoidal, conform or better than EN 61000-3-2 (IEC 555-2)				
Input current (A) at nominal input voltage	3.0	4.4	6.4	8.8	11.1
Input power factor	1				
Input frequency range	45 - 66 Hz				
Inrush current	none				
Output converter					
AC output voltage	220 / 230 / 240 V (selectable)				
AC output voltage tolerance	± 2%				
Output frequency	50 or 60 Hz, front selectable				
Output frequency range	nominal ± 0.15% unless synchronized to the mains				
Output waveform	sine wave				
Harmonic distortion	< 2% (typical 1%) with linear load				
Power factor	0.7				
Crest factor (peak to RMS current)	suitable for loads with c.f. up to 6:1				
Capacity appliance outlets	max. 10 A per outlet (one 16A outlet on VH Series 3000 VA)				
Bypass					
AC input voltage range	selected output voltage +15% -10%				
Frequency tracking rate	2 Hz/sec.				
Frequency tracking range	nominal ± 10%				
Phase difference	< 7°				
Typical transfer time, msec	1				
Overload capability	fully protected against overload and short circuits				
Overload behaviour during battery operation	110% during 5 minutes 150% during 5 seconds				
Overload behaviour during bypass operation	depends on rating of thermal circuit breaker typical: 125% of TCB value for 200 seconds 200% of TCB value for 10 seconds 300% of TCB value for 4 seconds				
Batteries (ratings given for 25°C)					
Nominal voltage (Vdc)	36	36	36	72	72
Number / Ah batteries	3 / 7	3 / 7	3 / 9	6 / 7	6 / 9
Type	sealed lead acid, maintenance free				
Service life	up to 6 years (depending on use)				
Recharge current	1.7 A				
Battery recharge time (batt. discharged at 100% load)	1.5 hours for 90% capacity, std battery				
Runtime in minutes at typical load (75%)	17	11	9	12	10
VA/Watts					
100/70	74	74	107	176	228
300/210	31	31	43	74	107
700/490	12	12	17	31	43
1000/700	-	7	11	20	29
1500/1050	-	-	5	12	17
2000/1400	-	-	-	8	11
3000/2100	-	-	-	-	6
General					
Weight UPS (kg)	18.3	18.3	19.3	31.1	33.1
Dimensions UPS (hxwxd, tower orientation)	440x87x472mm			440x87x547mm	
Weight 14Ah battery pack 36Vdc / 72V (kg)	29 / 47				
Dims batt pack 36Vdc/72Vdc (hxwxd, tower orientation)	440x87x472mm / 440x87x547mm				
Enclosure / protection	steel-plastic / IP20				
Environment					
Safety	EN 62040-1-1 (EN 60950)				
Electromagnetic compatibility	EN 62040-2				
Ambient temperature	-10 to +40°C				
Audible noise at 1 meter	< 45 dB(A), load and temperature dependent				
Max. relative humidity	95% (non-condensing)				